PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in and relating to Spectacle Lenses

We, VEB CARL ZEISS JENA, a corporation organised under the laws of Eastern Germany, of Carl-Zeiss-Strasse, Jena, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to lenses, more particularly lenses of high refractivity, for use in ordinary spectacles, in spectacle magnifiers and similar aids to vision.

Spectacles for the correction of severe ametropia and other visual aids of extremely short focal lengths are fitted with lenses which are rather thick and by no means easy to manufacture. The comparatively great weight of spectacles fitted with such lenses is often a nuisance to the wearer, and occasionally it is even considered bad taste to wear such glasses at all. On the other hand, spectacle magnifiers are sometimes in demand which it is difficult or even impossible to equip with conventional lenses.

Known lenses for the correction of strabism are made up of a plurality of interconnected parallel prisms in orthogonal sequence along the optical axis. Such lenses deflect the visual rays, but cannot bundle them at a common focus.

The present invention aims at obviating the foregoing disadvantages by providing a comparatively flat spectacle lens of light weight which is easy to manufacture and has an extremely short focal length and which combines the visual rays at one focus or a plurality of successive foci in the optical axis.

To this end, the present invention accordingly consists in a spectacle lens characterized in that at least one of its two faces carries Fresnel rings concentric with an axis and having active flanks of different inclinations. The face carrying the Fresnel rings may be plane, spherical or aspherical, but must be cylindrical if astigmatism is to be corrected. The face without Fresnel rings may have the same form as the other. The axis containing the centres of the Fresnel rings may coincide with or be parallel or at right angles to the optical axis of the lens, and it is a mere point if the Fresnel rings have one centre in common.

The spectacle lens according to the invention may be a multifocal glass in which the inclinations of the successive active flanks correspond to the different focal lengths in per se optional, but preferably alternate, sequence.

Advantageously the Fresnel system is protected against impurities or any kind of stress by a cover on the face carrying the Fresnel rings. This cover may either be an optical medium of a refractive index other than that of the spectacle lens and fill the spaces between the Fresnel rings, or be a cap slipped on the face carrying the Fresnel rings.

In order that the invention may be more readily understood, reference is made to the accompanying drawings, which illustrate diagrammatically and by way of example eight embodiments thereof, and in which:

Figures 1 to 6 show six embodiments in sections through the axes of spectacle lenses having Fresnel rings axially symmetrical to the optical axis;

Figure 7 is an elevation of an embodiment of a spectacle lens having Fresnel rings eccentric to the optical axis;

Figure 8 is a section through the optical axis of the lens of Figure 7;

Figure 9 is an elevation of an embodiment of a cylindrically curved spectacle lens, and

Figure 10 is a section through the optical axis of the lens of Figure 9.

[*Price* 4*s.* 6*d.*]

In Figure 1 of the drawings, the spectacle lens is a plane-parallel body 1 the face 2 of which carries Fresnel rings 3 coaxial with the optical axis O_1—O_1. Each Fresnel ring has an optically active flank 4 which refracts the greater part of the visual rays (not shown) and an interference flank 5 which diverges the remaining part of these rays.

In Figure 2, a body 6 has a convex face 7 and a plane face 8. The face 8 carries Fresnel rings 9 coaxial with the optical axis O_2—O_2. The face 7 intensifies the effect of the Fresnel rings 9. A similar effect can also be obtained by providing corresponding Fresnel rings on the curved, instead of the plane, face of the body 6.

Figure 3 shows a plane concave body 10 having an optical axis O_3—O_3. The plane face 11 of the body 10 carries Fresnel rings 12, 13 having active flanks 14, 15. The successive active flanks alternately have two different refractive powers. The spaces between the Fresnel rings 12, 13 are filled with an optical medium 16 the refractive index of which differs from that of the body 10. This medium serves as a protection against impurities. The remote surface of the medium 16 from the Fresnel rings 12, 13 is spherical, as in the concave face 18 of the body 10.

Figure 4 shows a plane concave body 19 having an optical axis O_4—O_4. The plane face 20 of the body 19 carries Fresnel rings 21 which are concentric with O_4—O_4 and separated from each other by plane rings 22. The Fresnel rings 21 and the plane rings 22, in co-operation with the concave face 23 of the body 19 and in cooperation with the eye of the spectacle wearer produce a sharp image of each of two objects (not shown) located at different distances. A transparent cap 24 represented by dash lines and hatchings can be slipped over the body 19 to prevent impurities from settling between the Fresnel rings 21.

Highly refractive spectacle lenses advantageously have the forms illustrated in Figure 5 and 6. In Figure 5, the plane faces 25 and 26 of a body 27 carry Fresnel rings 28 and 29, respectively, which are concentric with the optical axis O_5—O_5. The loss of light due to the interference flanks 30 and 31 can be reduced by giving the body the form shown in Figure 6. A transparent case 32 and a transparent lid 33 insertable into it have respectively an internal face 36 carrying Fresnel rings 34 and an internal face 37 carrying Fresnel rings 35, the optical axis being O_6—O_6. The system of rings 35 is coaxial with and air-spaced from that of the rings 36. Being inside the case 32 and lid 33, the Fresnel rings 34 and 35 are protected against impurities.

Figures 7 and 8 show a plane-parallel spectacle lens having an optical axis O_7—O_7. Fresnel rings 39 are cut into the one face of a plane-parallel plate 38 in such a manner as to be concentric with one point in an axis X_1—X_1 parallel to the optical axis O_7—O_7. This kind of lens is particularly suitable for correcting strabism.

In Figures 9 and 10, Fresnel rings 40 coaxial with an axis X_2—X_2 are provided on one face 41 of a cylindrically curved body 42, the Fresnel rings 40 succeeding each other along the cylindrical curve. The axis X_2—X_2 is at right angles to both the plane of the drawing (Figure 10) and the optical axis O_8—O_8 of the lens. This spectacle lens is particularly suitable for correcting astigmatism.

It is to be understood that although protective covers are only illustrated in the embodiments of Figures 3, 4 and 6, such covers may also be provided in the other embodiments illustrated.

WHAT WE CLAIM IS:—

1. A spectacle lens, characterized in that at least one of its two faces carries Fresnel rings concentric with an axis and having active flanks of different inclinations.

2. A lens as claimed in claim 1, wherein the face carrying the Fresnel rings is cylindrical.

3. A multifocal lens of the kind claimed in claims 1 and 2, wherein the inclinations of the successive active flanks alternately correspond to the different focal lengths.

4. A lens as claimed in any of claims 1 to 3, wherein the face carrying the Fresnel rings is protected by a cover.

5. A spectacle lens, substantially as hereindisclosed and with reference to any one of Figures 1 to 6, or Figures 7 and 8, or Figures 9 and 10 of the accompanying drawings.

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1154360 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

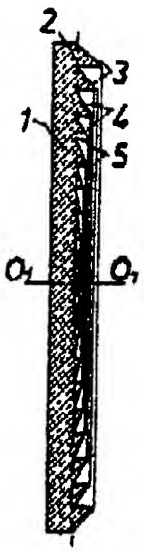

Fig.1

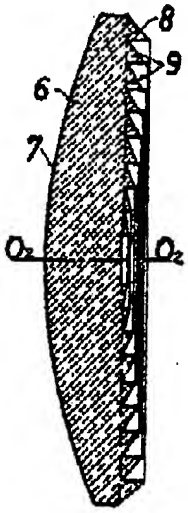

Fig.2

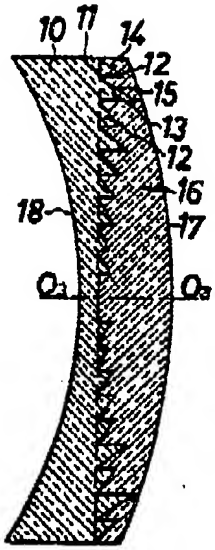

Fig.3

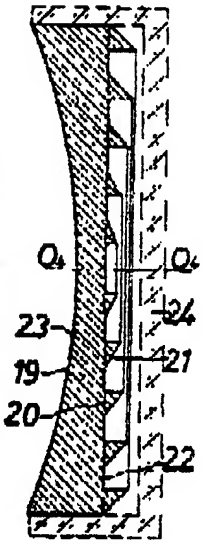

Fig.4

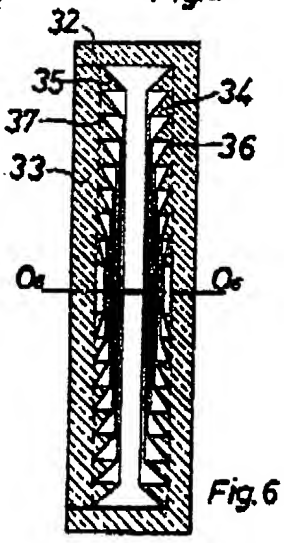

Fig.6

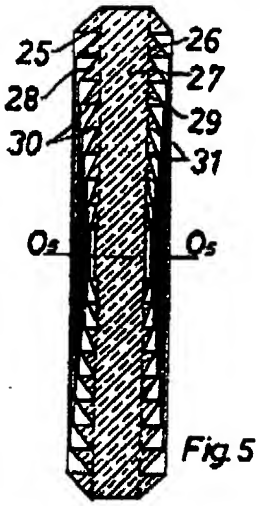

Fig.5

1154360 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

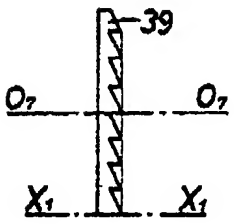

Fig. 8

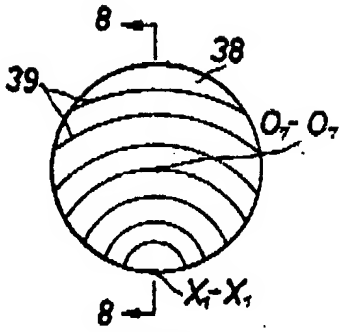

Fig. 7

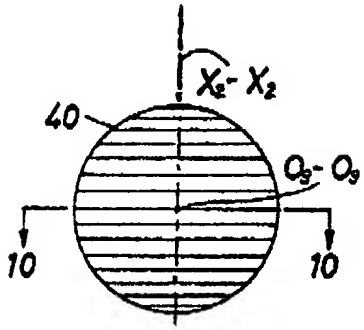

Fig. 9

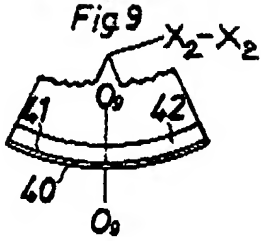

Fig. 10